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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/573,462 | KINOSHITA ET AL. | |
| | Examiner | Art Unit | |
| | Sean P. Cullen | 1795 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 August 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,3-15 and 17-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-15 and 17-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application.
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1, 3, 5, 11-15, 17, 19 and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Nagayama et al. (U.S. 2005/0208347).

Regarding claim 1, Nagayama et al. discloses a bipolar battery cell (10) comprising:

- a plurality of electric cells (20), each electric cell comprising:
  - a bipolar electrodes (30), including
  - a collector (22) having
    - a positive-electrode layer (28) on one surface and
    - a negative-electrode layer (26) on an opposing surface (Fig. 3, [0034]);
  - an electrolyte layer (27) that exchange ions between the positive-electrode layer (28) and the negative electrode layer (26, Fig. 4); and
  - a discharge circuit (50) printed on one or more of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27) within each electric cell (40, Fig. 4)
  - the discharge circuit (50) configured within each bipolar electrode (30) to electrically balance charged conditions ([0037]-[0039]) of adjacent electric cells (40).

Regarding claim 3, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- a contact area between the discharge circuit (50) and the bipolar electrode (30) that is more than 0.06 $mm^2$ per battery capacity of the bipolar battery 1 Ah (see 0.2 cm x 0.1 cm, [0097]; 202 mAh, [0104]; 1000 $mm^2$/Ah).

Regarding claim 5, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein the discharge circuit (50) includes a zener diode layer (32).

Regarding claim 11, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- further comprising a sheathing material (16) that covers and seals the bipolar electrodes (30), the electrolyte layers (27), and the discharge circuit (50, Fig. 2).

Regarding claim 12, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- further comprising a conductive sealing material (36, [0036]).

Regarding claim 13, Nagayama et al. discloses an assembled battery (70) comprising:

- a plurality of bipolar battery cells (10, Fig. 15C),
- wherein each bipolar battery cell (10) comprises:
    - a plurality of electric cells (20) each electric cell comprising:
    - a laminated bipolar electrodes (30) including
        - a collector (22) having
            - a positive-electrode layer (28) on one surface and

- a negative-electrode layer (26) on an opposing surface (Fig. 3, [0034]);

- a electrolyte layer (27) that exchange ions between the positive-electrode layer (28) and the negative electrode layer (26, Fig. 4); and
- a discharge circuit (50) printed on one or more of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27, Fig. 4) that electrically balances charged conditions ([0037]-[0039]) of adjacent bipolar electrodes (30).

Regarding claim 14, Nagayama et al. discloses a vehicle (80) comprising:

- a controller (see control circuit, [0083]); and
- an assembled bipolar battery (70) comprising
  - a plurality of bipolar battery cells (10), wherein each bipolar battery cell (10) comprises:
    - a plurality of electric cells (20), each electric cell (20) comprising
      - a bipolar electrode (30) including
      - a collector (22) having
        - a positive-electrode layer (28) on one surface and
        - a negative-electrode layer (26) on an opposing surface (Fig. 3, [0034]);
      - an electrolyte layers (27) that exchange ions between the positive-electrode layer (28) and the negative electrode layer (26, Fig. 4) and

- a discharge circuit (50) printed on one or more of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27) that electrically balances charged conditions ([0037]-[0039]) of adjacent bipolar electrodes (30).

Regarding claim 15 Nagayama et al. discloses a method of forming a bipolar battery cell (10) each bipolar battery cell (10) comprising a plurality of electric cells (20) comprising:

- laminating [0033] a bipolar electrodes (30) including
  - a collector (22) having
    - positive-electrode layer (28) on one surface and
    - a negative-electrode layer (26) on an opposing surface (Fig. 3, [0034]);
- with an electrolyte layer (27) that exchange ions between the positive-electrode layer (28) and the negative electrode layer (26, Fig. 4); and
- a discharge circuit (50) printed on one or more of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27, Fig. 4) that electrically balance charged conditions ([0037]-[0039]) of adjacent bipolar electrodes (30) to form each electric cell (20) of the plurality of electric cells (10).

Regarding claim 17, Nagayama et al. discloses a bipolar battery cell (10) comprising:

- a plurality of electric cells (20), each electric cell (20) comprising:
  - a bipolar electrode (30) including
    - a collector (22) having

- a positive-electrode layer (28) on one surface and
- a negative-electrode layer (26) on an opposing surface (Fig. 3, [0034]);

- a means for exchanging ions (27) between the positive-electrode layer (28) and the negative electrode layer (26, Fig. 4); and
- a means for balancing the bipolar battery cell (50) by electrically balances charged conditions ([0037]-[0039]) of adjacent bipolar electrodes (30),
- the means for balancing (50) located on one or more of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27, Fig. 4).

Regarding claim 19, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein each electric cell (20) further comprises
  - conductive bodies (22A and 22B) printed on each of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27, Fig. 4),
  - wherein the discharge circuit (50) is located directly between two conductive bodies (22A and 22B, Fig. 4).

Regarding claim 20, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein the conductive bodies (22A and 22B) located on each of the positive-electrode layer (28), the negative electrode layer (26) and electrolyte layer (27)

are positioned such that the conductive bodies (22A and 22B) electrically conduct with adjacent conductive bodies (22A and 22B, Fig. 4).

***Claim Rejections - 35 USC § 103***

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagayama et al. (U.S. 2005/0208347) as applied to claim 1 above, and further in view of Einthoven et al. (U.S. 2003/0205775).

Regarding claim 4, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein a threshold of a discharge voltage in the discharge circuit is set between 3.6 V-4.1 V (see 4 V, [0039]), and

Nagayama et al. does not explicitly disclose:

- wherein a doping concentration is set between $10^{17}$-$10^{18}$ $cm^{-3}$, and
- the thickness of a depletion layer is set between 0.1 μm-1.0 μm so as to set a breakdown voltage of a PN-junction of the discharge circuit the same as to the threshold.

Einthoven et al. discloses a voltage suppression device (abstract) with a doping concentration $10^{17}$-$10^{18}$ $cm^{-3}$ (see 2 x $10^{17}$-2 x $10^{18}$ $cm^{-3}$, [0051]) and the thickness of a depletion layer is set between 0.1 μm-1.0 μm (see 0.2 μm, [0035]) to control the breakdown voltage of the device [0048]. Nagayama et al. and Einthoven et al. are analogous art because they are directed

to voltage suppression devices (solid state semiconductor). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Nagayama et al. using the voltage suppression device of Einthoven to control the breakdown voltage.

5. Claims 6-10 and 18 rejected under 35 U.S.C. 103(a) as being unpatentable over Nagayama et al. (U.S. 2005/0208347) as applied to claims 1 above, and further in view of Horie et al. (U.S. 2001/0019794).

Regarding claims 6-10 and 18, Nagayama et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- further comprising a sheathing material (16) that covers and seals the bipolar electrodes (30), the electrolyte layers (27) and the discharge circuit (50, Fig. 2)
- wherein the discharge circuit (50) comprises a voltage balancing circuit (50, [0037]-[0039]).

Nagayama et al. does not explicitly disclose:

- wherein the discharge circuit includes a luminescent device.
- further comprising a light guiding device arranged between the luminescent device and an end of the battery cell.
- further comprising a light sensor that responds to light emitted from the relevant luminescent device.
- wherein the discharge circuit includes a constant current circuit.
- further comprising a sheathing material that covers and seals the light sensor.

Horie et al. discloses a bipolar battery cell (see cell group of a battery, abstract) wherein the discharge circuit (1) includes a luminescent device (see luminescent element, Fig. 1); further comprising a light guiding device (12) arranged between the luminescent device (11) and an end of the battery cell (Fig. 8); further comprising a light sensor (4) that responds to light emitted from the relevant luminescent device (11, [0065]); wherein the discharge circuit (1) includes a constant current circuit (20, Fig. 9A); wherein the discharge circuit (1) includes a constant current circuit (20, Fig. 9A); and wherein the discharge circuit comprises an abnormal voltage detecting circuit (4 and 12) to sense the voltage of the battery cells without the need of complex circuitry and reduce the current consumption of the discharge circuit [0010] to increase the energy density and efficiency of the battery. Nagayama et al. and Horie et al. are analogous art because they are directed to bipolar battery cell assemblies. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Nagayama et al. with the luminescent device, light guiding device and light sensor of Horie et al. to sense the voltage of the battery cells without the need of complex circuitry and reduce the current consumption of the discharge circuit to increase the energy density and efficiency of the battery.

6. Claims 1, 3, 5, 11-15, 17, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamitsu et al. (U.S. 2004/0038123) in view of Nakanaga et al. (JP 02044660, see English-language abstract).

Regarding claims 1 and 11, Hisamitsu et al. discloses a bipolar battery cell (1) comprising:

- a plurality of electric cells (Fig. 3), each electric cell comprising:
    - a bipolar electrodes (30), including
        - a collector (31) having
            - a positive-electrode layer (32) on one surface and
            - a negative-electrode layer (33) on an opposing surface (Fig. 3);
        - an electrolyte layer (40) that exchange ions between the positive-electrode layer (32) and the negative electrode layer (33, Fig. 3; [0079]); and
        - a discharge circuit (50)
        - the discharge circuit (50) configured within each bipolar electrode (30) to electrically balance charged conditions of adjacent electric cells ([0123]-[0125]).
- further comprising a sheathing material (45) that covers and seals the bipolar electrodes (30) and the electrolyte layers (40).

Hisamitsu et al. does not explicitly disclose:

- a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each electric cell.
- a sheathing material that covers and seals the discharge circuit

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) comprising a discharge circuit (9) printed on one or more of the positive-electrode layer (3 and 7), the negative electrode layer (5) and electrolyte layer (6) within each electric cell (Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Hisamitsu et al. and Nakanaga et al. are analogous art because they are directed to battery cells with discharge circuits. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

It further would have been obvious to integrate the discharge circuit of Hisamitsu et al. into the electrical cell; since, it has been held that forming in one piece an article has formerly been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1893).

If a technique has been used to improve one device (integrating a discharge circuit into an electric cell) and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way (providing a discharge circuit that is a single piece unit thereby allowing for ease of assembly of the battery cell), using the technique is obvious unless its actual application is beyond his or her skill. See MPEP § 2141 (III) Rational C from KSR v. Teleflex (Supreme Court 2007).

Regarding claim 3, modified Hisamitsu et al. discloses all claim limitations set forth above, but does not explicitly disclose a bipolar battery cell:

- a contact area between the discharge circuit and the bipolar electrode that is more than 0.06 $mm^2$ per battery capacity of the bipolar battery 1 Ah.

As the size of the opening for the discharge circuit and thickness of discharge circuit are variables that can be modified, among others, by adjusting the contact area between the discharge circuit and the bipolar electrode, with the opening for the discharge circuit increasing and the thickness of the discharge circuit decreasing as the contact area is increased (Nakanaga et al., Drawing 4), the contact area would have been considered a result effective variable by one having ordinary skill in the art at the time the invention was made. As such, without showing unexpected results, the claimed contact area cannot be considered critical. Accordingly, one of ordinary skill in the art at the time the invention was made would have optimized, by routine experimentation, the contact area in the bipolar battery cell of modified Hisamitsu et al. to obtain the desired balance between the size of the opening of the discharge circuit and the thickness of the discharge circuit (*In re Boesch*, 617 F.2d. 272, 205 USPQ 215 (CCPA 1980)), since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. (*In re Aller*, 105 USPQ 223).

Regarding claim 5, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein the discharge circuit (50) includes a zener diode layer (52).

Regarding claim 12, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- further comprising a conductive sealing material (45, [0050]).

Regarding claim 13, Hisamitsu et al. discloses an assembled battery (Fig. 3) comprising:

- a plurality of bipolar battery cells (see plurality of bipolar batteries, [0148]),
- wherein each bipolar battery cell (Fig. 3) comprises:
    - a plurality of electric cells (Fig. 3) each electric cell comprising:
    - a laminated bipolar electrodes (30) including
        - a collector (31) having
            - a positive-electrode layer (32) on one surface and
            - a negative-electrode layer (33) on an opposing surface (Fig. 3);
    - a electrolyte layers (40) that exchange ions between the positive-electrode layer (32) and the negative electrode layer (33, [0079]); and
    - a discharge circuit (50) that electrically balances charged conditions of adjacent bipolar electrodes (30, [0123]-[0125]).

Hisamitsu et al. does not explicitly disclose:

- a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) comprising a discharge circuit (9) printed on one or more of the positive-electrode layer (3 and 7), the negative electrode layer (5) and electrolyte layer (6) within each electric cell (Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of

Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

Regarding claim 14, Hisamitsu et al. discloses a vehicle (801) comprising:

- a controller (see unit cell controller, [0147); and
- an assembled bipolar battery (800) comprising
    - a plurality of bipolar battery cells (see plurality of bipolar batteries, [0148]), wherein each bipolar battery cell (see stack type battery, abstract) comprises:
        - a plurality of electric cells, each electric cell comprising
            - a bipolar electrode (30) including
            - a collector (31) having
                - a positive-electrode layer (32) on one surface and
                - a negative-electrode layer (33) on an opposing surface (Fig. 3);
            - an electrolyte layers (40) that exchange ions between the positive-electrode layer (32) and the negative electrode layer (33, [0079]) and
            - a discharge circuit (50) that electrically balances charged conditions of adjacent bipolar electrodes (30, [0123]-[0125]),

Hisamitsu et al. does not explicitly disclose:

- a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) comprising a discharge circuit (9) printed on one or more of the positive-electrode layer (3 and 7), the negative electrode layer (5) and electrolyte layer (6) within each electric cell (Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

Regarding claim 15, Hisamitsu et al. discloses a method of forming a bipolar battery cell (Fig. 3) each bipolar battery cell (Fig. 3) comprising a plurality of electric cells (Fig. 3) comprising:

- laminating a bipolar electrodes (340, [0047]) including
    - a collector (31) having
        - positive-electrode layer (32) on one surface and
        - a negative-electrode layer (33) on an opposing surface (Fig. 3);
- with an electrolyte layer (40) that exchange ions between the positive-electrode layer (32) and the negative electrode layer (33, Fig. 3; [0047] and [0079]); and
- a discharge circuit (50) that electrically balance charged conditions of adjacent bipolar electrodes (30) to form each electric cell of the plurality of electric cells (Fig. 3, [0123]-[0125]).

Hisamitsu et al. does not explicitly disclose:

- a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) comprising a discharge circuit (9) printed on one or more of the positive-electrode layer (3 and 7), the negative electrode layer (5) and electrolyte layer (6) within each electric cell (Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

Regarding claim 17, Hisamitsu et al. discloses a bipolar battery cell (Fig. 3) comprising:

- a plurality of electric cells (Fig. 3), each electric cell comprising:
  - a bipolar electrode (30) including
    - a collector (31) having
      - a positive-electrode layer (32) on one surface and
      - a negative-electrode layer (33) on an opposing surface (Fig. 3);
  - a means for exchanging ions (40) between the positive-electrode layer (32) and the negative electrode layer (33, [0079]); and
  - a means for balancing the bipolar battery cell (50) by electrically balances charged conditions of adjacent bipolar electrodes (30, [0123]-[0125])),

Hisamitsu et al. does not explicitly disclose:

- the means for balancing located on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer.

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) comprising a discharge circuit (9) printed on one or more of the positive-electrode layer (3 and 7), the negative electrode layer (5) and electrolyte layer (6) within each electric cell (Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

Regarding claim 19, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein each electric cell (Fig. 3) further comprises conductive bodies (31) printed on each of the positive-electrode layer (32), the negative electrode layer (33) and electrolyte layer (40, Fig. 3),

Hisamitsu et al. does not explicitly disclose:

- wherein the discharge circuit is located directly between two conductive bodies.

Nakanaga et al. discloses a bipolar battery cell (Drawing 4) wherein a discharge circuit (3 and 7) is located directly between two conductive bodies (1 and 8, Drawing 4) in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell. Therefore, it would have been obvious to one of ordinary skill in the art

at the time of the invention to make the bipolar battery cell of Hisamitsu et al. with the configuration of Nakanaga et al. in order to provide a discharge circuit that is a single piece unit there by allowing for ease of assembly of the bipolar battery cell.

Regarding claim 20, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery:

- wherein the conductive bodies (31) located on each of the positive-electrode layer (32), the negative electrode layer (33) and electrolyte layer (40) are positioned such that the conductive bodies (31) electrically conduct with adjacent conductive bodies (Fig. 2).

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamitsu et al. (U.S. 2004/0038123) in view of Nakanaga et al. (JP 02044660, see English-language abstract) as applied to claim 1 above, and further in view of Einthoven (U.S. 2003/0205775).

Regarding claim 4, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- wherein a threshold of a discharge voltage in the discharge circuit is set between 3.6 V-4.1 V (see 4.0 V, [0124]), and

Hisamitsu et al. does not explicitly disclose:

- wherein a doping concentration is set between $10^{17}$-$10^{18}$ $cm^{-3}$, and
- the thickness of a depletion layer is set between 0.1 μm-1.0 μm so as to set a breakdown voltage of a PN-junction of the discharge circuit the same as to the threshold.

Einthoven et al. discloses a voltage suppression device (abstract) with a doping concentration $10^{17}$-$10^{18}$ $cm^{-3}$ (see 2 x $10^{17}$-2 x $10^{18}$ $cm^{-3}$, [0051]) and the thickness of a depletion layer is set between 0.1 μm-1.0 μm (see 0.2 μm, [0035]) to control the breakdown voltage of the device [0048]. Hisamitsu et al. and Einthoven et al. are analogous art because they are directed to voltage suppression devices (solid state semiconductor). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of modified Hisamitsu et al. using the voltage suppression device of Einthoven to control the breakdown voltage.

8. Claims 6-10 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisamitsu et al. (U.S. 2004/0038123) in view of Nakanaga et al. (JP 02044660, see English-language abstract) as applied to claims 1 above, and further in view of Horie et al. (U.S. 2001/0019794).

Regarding claims 6-10 and 18, modified Hisamitsu et al. discloses all claim limitations set forth above and further discloses a bipolar battery cell:

- further comprising a sheathing material (45) that covers and seals the bipolar electrodes (30) and the electrolyte layers (40, Fig. 3)
- wherein the discharge circuit (50) comprises a voltage balancing circuit ([0123]-[0125]).

Nagayama et al. does not explicitly disclose:

- wherein the discharge circuit includes a luminescent device.

- further comprising a light guiding device arranged between the luminescent device and an end of the battery cell.
- further comprising a light sensor that responds to light emitted from the relevant luminescent device.
- wherein the discharge circuit includes a constant current circuit.
- further comprising a sheathing material that covers and seals the light sensor and the discharge circuit.

Horie et al. discloses a bipolar battery cell (see cell group of a battery, abstract) wherein the discharge circuit (1) includes a luminescent device (see luminescent element, Fig. 1); further comprising a light guiding device (12) arranged between the luminescent device (11) and an end of the battery cell (Fig. 8); further comprising a light sensor (4) that responds to light emitted from the relevant luminescent device (11, [0065]); wherein the discharge circuit (1) includes a constant current circuit (20, Fig. 9A); wherein the discharge circuit (1) includes a constant current circuit (20, Fig. 9A); and wherein the discharge circuit comprises an abnormal voltage detecting circuit (4 and 12) to sense the voltage of the battery cells without the need of complex circuitry and reduce the current consumption of the discharge circuit [0010] to increase the energy density and efficiency of the battery. Nagayama et al. and Horie et al. are analogous art because they are directed to bipolar battery cell assemblies. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to make the bipolar battery cell of Nagayama et al. with the luminescent device, light guiding device and light sensor of Horie et al. to sense the voltage of the battery cells without the need of complex circuitry and

reduce the current consumption of the discharge circuit to increase the energy density and efficiency of the battery.

***Response to Arguments***

9. Applicant's arguments filed August 4, 2010 have been fully considered but they are not persuasive.

Regarding applicant's argument that Nagayama et al. does not disclose a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer (page 6, para. 2), Nagayama et al. discloses a diode forming region (24), which is equivalent to the discharge circuit of the instant application, printed on the negative electrode layer (26, Fig. 3). Therefore, Nagayama et al. discloses a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer.

Regarding applicant's argument that Nagayama et al. discloses a diode region 24 having groups of diodes 50 disposed on one side of each of current collecting bodies 22 that form a bipolar electrode 30 (page 6, para. 2), Nagayama et al. also discloses a negative pole layer 26 disposed on the same side of the current collecting bodies 22 that form a bipolar electrode 30. Therefore, Nagayama et al. discloses a negative pole layer, which is equivalent to the negative electrode layer of the instant application, and a diode region, which is equivalent to the discharge circuit of the instant application, disposed in the same layer.

Regarding applicant's argument that Fig. 4 is a cross-sectional view of an electrode cell 40 that clearly illustrates the diodes 50 contacting collector 22B and layered in the direction of collector 22A with an electrically conducting adhesive agent 36 between the upper diode and

collector 22A (page 6, para. 2), Fig. 8 clearly illustrates the diode forming regions (24A-F) are formed on the same layer as the positive electrode layers (28A-C) and the negative electrode layers (26A-C). Therefore, Nagayama et al. discloses a discharge circuit printed on one or more of the positive-electrode layer, the negative-electrode layer and electrolyte layer.

Regarding applicant's argument that the group of diodes 50 are electrically insulated from the positive pole 28 and the negative pole by sealing part 25 (page 6, para. 2), Nagayama et al. clearly discloses a discharge circuit (24, Fig. 3; 24A-F, Fig. 8) printed on one or more of the positive-electrode layer (28A-C, Fig. 8) and the negative-electrode layer (26, Fig. 3; 26A-C, Fig. 8). The instant application clearly illustrates that the discharge circuit (210) does not directly the electrolyte layer (208, Fig. 2). The instant application also illustrate that the discharge circuit (210) is separated from the positive-electrode material (269), the electrolyte (266) and the negative electrode material (261) by insulation material (262, Figs. 5 and 9). Therefore, Nagayama et al. discloses a discharge circuit printed on one or more of the positive-electrode layer, the negative-electrode layer and electrolyte layer.

Regarding applicant's argument that claims 1, 13-15 and 17 are allowable because Nagayama et al. fails to disclose a discharge circuit printed on one or more of the positive-electrode layer, the negative-electrode layer and electrolyte layer within each cell (page 6, para. 3), Nagayama et al. discloses a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each cell as detailed above.

Regarding applicant's argument that Nagayama et al. fails to disclose a discharge circuit configured within each bipolar electrode to electrically balance charged conditions of adjacent electric cells (page 6, para. 3), this argument fails to comply with 37 CFR 1.111(b) because it

amounts to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Regarding applicant's arguments that claims 3, 5, 11, 12, 19 and 20 are allowable because they depend from claim 1 (page 6, para. 3), claim 1 is not allowable as detailed above.

Regarding applicant's argument that Einthoven et al. does not teach or suggest a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each cell (page 7, para. 2), Einthoven et al. does not disclose all the features of the present claimed invention, Einthoven et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), In re Keller 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, namely doping concentration and thickness of a depletion layer, and in combination with the primary reference, discloses the presently claimed invention.

Regarding applicant's argument that claim 4 is allowable because it depends from claim 1 (page 7, para. 2), claim 1 is not allowable as detailed above.

Regarding applicant's argument that Horie et al. does not teach or suggest a discharge circuit printed on one or more of the positive electrode layer, the negative electrode layer and electrolyte layer within each electric cell (page 7, para. 3), Horie et al. does not disclose all the features of the present claimed invention, Horie et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), In re Keller 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a

certain concept, namely a discharge circuit comprising a luminescent device, light guiding device and a light sensor, and in combination with the primary reference, discloses the presently claimed invention.

Regarding applicant's argument that claims 6-10 and 18 are allowable because they depend from claim 1 (page 7, para. 3), claim 1 is not allowable as detailed above.

Regarding applicant's argument that Hisamitsu et al. does not disclose a discharge circuit configured within each bipolar electrode (page 8, para. 1), a circuit is defined as "the complete path of an electric current, including the generating apparatus, intervening resistor, or capacitors" (see http://dictionary.reference.com/browse/circuit). Therefore, an electrical cell electrically connected to a discharge circuit is part of the discharge circuit. Therefore, Hisamitsu et al. discloses a discharge circuit, which is electrically connected to an electrical cell, configured within each bipolar electrode.

Regarding applicant's argument that the circuit 50 is not printed as claimed and cannot be the discharge circuit of the claims (page 8, para. 1), the examiner does not contend that the discharge circuit is printed. Further, the examiner notes that the determination of patentability is determined by the recited structure of the apparatus and not by a method of making said structure. A claim containing a recitation with respect to the manner in which a claimed apparatus is made does not differentiate the claimed apparatus from a prior art apparatus if the prior art apparatus teaches all the structural limitations of the claim. See MPEP § 2113 and § 2114.

Regarding applicant's argument that Nakanaga et al. fails to disclose a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and

electrolyte layer within each electric cell (page 8, para. 2), Nakanaga et al. discloses a discharge circuit (9) printed on one or more of the positive-electrode layer (7), the negative electrode layer (5) and electrolyte layer (6, Fig. 4) within each electric cell (Fig. 4).

Regarding applicant's argument that the only circuit disclosed by Nakanaga et al. is laminated between the negative collector 4 and a metal terminal 1 (page 8, para. 2), Nakanaga et al. discloses a circuit (9) laminated between the metal terminal (1) and the positive collector (8). Therefore, Nakanaga et al. discloses a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each electric cell.

It further would have been obvious to integrate the discharge circuit of Hisamitsu et al. into the electrical cell; since, it has been held that forming in one piece an article has formerly been formed in two pieces and put together involves only routine skill in the art. Howard v. Detroit Stove Works, 150 U.S. 164 (1893).

If a technique has been used to improve one device (integrating a discharge circuit into an electric cell) and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way (providing a discharge circuit that is a single piece unit thereby allowing for ease of assembly of the battery cell), using the technique is obvious unless its actual application is beyond his or her skill. See MPEP § 2141 (III) Rational C from KSR v. Teleflex (Supreme Court 2007).

Regarding applicant's argument that the combination of Hisamitsu et al. and Nakanaga et al. fails to suggest to one skilled in the art a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each electric cell (page 8, para. 2), the combination of Hisamitsu et al. and Nakanaga et al. suggest to one

skilled in the art a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each electric cell as detailed above.

Regarding applicant's argument that claims 1, 13-15 and 17 are allowable because the cited references. fails to teach or suggest a discharge circuit printed on one or more of the positive-electrode layer, the negative-electrode layer and electrolyte layer within each cell (page 8, para. 3), the cited references teach and suggest a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each cell as detailed above.

Regarding applicant's arguments that claims 3, 5, 11, 12, 19 and 20 are allowable because they depend from claim 1 (page 8, para. 3), claim 1 is not allowable as detailed above.

Regarding applicant's argument that Einthoven et al. does not teach or suggest a discharge circuit printed on one or more of the positive-electrode layer, the negative electrode layer and electrolyte layer within each cell (page 8, para. 4), Einthoven et al. does not disclose all the features of the present claimed invention, Einthoven et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), In re Keller 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, namely doping concentration and thickness of a depletion layer, and in combination with the primary reference, discloses the presently claimed invention.

Regarding applicant's argument that claim 4 is allowable because it depends from claim 1 (page 9, para. 1), claim 1 is not allowable as detailed above.

Regarding applicant's argument that Horie et al. does not teach or suggest a discharge circuit printed on one or more of the positive electrode layer, the negative electrode layer and electrolyte layer within each electric cell (page 9, para. 2), Horie et al. does not disclose all the features of the present claimed invention, Horie et al. is used as teaching reference, and therefore, it is not necessary for this secondary reference to contain all the features of the presently claimed invention, In re Nievelt, 482 F.2d 965, 179 USPQ 224, 226 (CCPA 1973), In re Keller 624 F.2d 413, 208 USPQ 871, 881 (CCPA 1981). Rather this reference teaches a certain concept, namely a discharge circuit comprising a luminescent device, light guiding device and a light sensor, and in combination with the primary reference, discloses the presently claimed invention.

Regarding applicant's argument that claims 6-10 and 18 are allowable because they depend from claim 1 (page 9, para. 2), claim 1 is not allowable as detailed above.

***Conclusion***

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sean P. Cullen whose telephone number is 571-270-1251. The examiner can normally be reached on Monday thru Thursday 6:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Basia Ridley can be reached on 571-272-1453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/S. P. C./
Examiner, Art Unit 1795

/Robert Hodge/
Primary Examiner, Art Unit 1795